

EVTN - A Growing Leader in Environmental and Industrial Separation Technology



Enviro Voraxial Technology

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Case Study: Oilfield Salt Water Injection Plant-API Oil Recovery

Our case studies are intended to help customers choose equipment and systems solutions that fits their needs in a reliable and cost-effective manner. Information in this Case Study relates the positive financial and operating benefits at a customer's salt water injection plant (SWIP) resulting from the use of our equipment.

Introduction

A customer's oil production field has a long history of oil carryover problems to the water injection tank and WIWS.

- ◆ Currently the field produces 670 bopd and 72,000 bwpd through (4) 10'x30' FWKOs. The water is dumped to one (1) 1000 bbl and one (1) 2000 bbl salt water.
- ◆ The oil carryover to the salt water tanks can be as high as 1000 ppm and has averaged 700 ppm over the last two (2) years.
- ◆ Oil skimming operations with a tank truck on a weekly basis captures about 70% of that oil carryover, leaving 30% (200 ppm) to depart the plant and to enter the injection system.

The Problem

Oil carryover at the SWIP raises the down-hole failure rate unacceptably. Furthermore, the carryover results in a conservative 12 bopd of saleable oil lost to the company. As the value of oil rises in the world marketplace, recovery of this "lost" oil becomes important to maximize utilization of the oilfield's production capability.

Project

EVTN and the customer reviewed all available equipment and treatment options to optimize the capture of all available oil at the SWIP in a cost effective manner.

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A detailed review of all aspects of the cost of operation at the SWIP was undertaken. The consensus opinion reached between EVTN and the customer was that installation of a VAS8000 Voraxial Separator (2500 gpm) and revision to the corrosion inhibition program would recover over 12 bopd, reduce chemical cost and reduce down-hole failure.

The detailed cost of analysis, presented hereinafter, shows that a two (2) year payback on the cost and operation of the VAS8000 Voraxial Separator based \$28 per bbl NYMEX for recovered oil and operating expense savings of \$5,180/month.

Operations and Installations Analysis

History of Operations

Due to oil carryover problems, several chemical programs were implemented into the field in an effort to reduce oil carryovers while maintaining good corrosion protection:

- ◆ RN-219 was the original preferred choice of chemical, mostly due to its success in other fields, however because of high oil carryovers, other chemicals were tried.
- ◆ R-2438 was implemented in September 1998.
- ◆ R-2514 was attempted in May 2000.
- ◆ A short trial with R-368 was implemented from March 2002 until May 2002 when R-2514 was reimplemented. The change R-2514 was done to improve the oil carryover problem with the hope that the failure trend would continue downward.

Although some improvements were seen in the oil carryovers, recent failure analyses are showing a growing trend upwards in failure rates.

- ◆ The failure rate in 2002 was 0.69 failures/well/year (FWY). The corrosion inhibition program was apparently weakened by reimplementing a treating program using Champion Cortron R-2514, oil soluble water dispersible corrosion inhibitor in May 22002.
- ◆ The failure rate jumped to 0.80 FWY in the 3rd quarter 2003 and jumped to 0.92 FWY average for year-end 2003.

The installation of the Voraxial Separator will permit the use of the better suited RN-219 corrosion inhibitor back in use, therefore letting the Voraxial Separator handle the increased oil carryover.

Monthly skimming operations cost approximately \$800/month and the reductions in skimming cost using the Voraxial Separator are included in the project economics analysis.

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- ◆ A conservative 12 bopd is recoverable and available to sales with the installation of the Voraxial Separator.
- ◆ Furthermore, the chemical program should be able to be improved to a higher-grade corrosion inhibition program (RN-219) and thereby yielding a down-hole failure cost reduction of about \$5,000/month. Additionally, the reduced chemical cost associated with the switch to RN-219 is estimated to be around \$600/month.

Voraxial Separator Installation Analysis

The current well pull costs are running about \$15,000/month (2003 year end average), \$2,500/mo above the prior 18 month average as of June 30,2003. Reducing the pull rate down to 0.60 pulls per month could result in a pull expense savings of around \$5,000/month by switching over to the RN-219 corrosion inhibitor. There will be an immediate cost reduction of about \$600/month (380 gals/mo @ \$1.95 /gal) associated with the chemical switch. This cost savings in reduced work over expense and chemical cost per gallon is included in the project economics analysis.

Table No. 1
Voraxial Separator Installation
API Oil Carryover Recovery
Cost Estimate

Voraxial Separator	\$225,000
Freight	\$10,000
Electricians	\$10,000
Valve, piping & fittings	\$20,000
Heater treater equipment	\$2,500
Waste-oil transfer pump	\$7,500
Metering Equipment	\$2,000
Pad	\$5,000
Install costs	\$15,000
Misc. and contingencies	\$1,000
Total	\$298,000

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Table No. 2
Voraxial Separator Installation
Economic Spreadsheet

Description	Value	Notes
Incremental Oil Rate Increase (BOPD)	12	
Incremental Water Rate Increase (BWPD)	0	
Incremental Fluid Rate Increase (BFPD)	12	
NYMEX Oil Price(\$/STB)	\$28.00	
Differential (\$/STB)	\$3.49	
Oil Severance Tax (dec.)	\$0.0720	
Oil Ad Valorem Tax (dec.)	\$0.0	
WI (dec.)	1.0000000	
NRI (dec.)	0.875000	
Gross Variable Cost (\$/BF)	0.0310	
Gross Capital Cost (\$)	\$298,000	
Net Capital Cost (\$)	\$298,000	
Net Variable Operating Cost Increase (\$/mo)	\$11	
Direct Operating Expense	\$2,000	Direct repair & replacement cost (\$48,000/2yrs)
Direct Operating Expense	\$1,200	Electricity for Separator
Direct Operating Expense	-\$800	Eliminate tank truck skimming operations
Direct Operating Expense	-\$5,000	Reduced pulling costs
Direct Operating Expense	-\$600	Reduction of chemicals cost
Net Cash Flow	\$12,429	
Payout (mo)	24.0	
Payout (yrs)	2.0	
Project Assessment	Favorable	

Recommendation

It is recommended to install the Voraxial Separator with the associated peripheral equipment as described above and switch the Champion Corrosion Inhibitor to RN-219 and to capture 12 bopd in oil carryover that would otherwise be lost to the salt-water injection system and reduced operating expenses by \$5,180/mo.

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Appendix A – Proposed Installation Consideration

1. Install Enviro Voraxial Technology, Inc. Voraxial Separator Model VAS8000 at a total installed capital cost of \$298,000. The additional electrical expense for the 50 hp electric motor to run the Voraxial Separator and a 20hp electric motor to run the waste- oil transfer pump is included in the project economics. The additional for these two motors is estimated to be about \$1200/month.
2. Additionally, the repair, replace and maintenance costs for the Voraxial Separator will be warranted by the vendor for two years. It is estimated that the maintenance on the unit for years three and on will average around \$2,000/month.
3. This proposal includes the addition of a company owned heater treater to process the oil waste stream from the Voraxial Separator. Although the primary function will be oil waste stream processing, there could be utility in using this equipment for bad oil treating in the future. Out of pocket expenses for the heater treater are minimal but are included in the projects economics. The material transfer cost for the company owned equipment was not included in the projects economics.
4. An alternate study to add an additional 10’x30’ FWKO and an additional 3000 bbl produced water tank was performed for comparative results. The costs associated with this scenario would be around \$150,000 and anticipated oil carryovers would only be half as good as the Voraxial Separator scenario. Furthermore, there are no warranties whatsoever with this scenario.

Mission Statement

EVTN will create environmental and industrial solutions that efficiently separate and treat various waste streams and return clean water to the environment while improving the productivity and profitability of our customer’s operations.

EVTN encourages joint development with our customers of new applications for the patented Voraxial Separator.
